

U.S. ENVIRONMENTAL PROTECTION AGENCY  
POLLUTION/SITUATION REPORT  
Bonanza Mine and Mill - Removal Polrep



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
Region X

**Subject:** POLREP #2  
Bonanza Mine POLREP #2  
Bonanza Mine and Mill  
  
Sutherlin, OR  
Latitude: 43.3899870 Longitude: -123.1845630

**To:** Brooks Stanfield, EPA Region 10  
  
**From:** Dan Heister, On-Scene Coordinator  
**Date:** 8/28/2014  
**Reporting Period:** 8/18/14 to 8/29/14

1. Introduction

1.1 Background

<b>Site Number:</b>	10NE	<b>Contract Number:</b>	START 14-06-0006
<b>D.O. Number:</b>	ERRS 0013/030309.0013	<b>Action Memo Date:</b>	6/4/2014
<b>Response Authority:</b>	CERCLA	<b>Response Type:</b>	Time-Critical
<b>Response Lead:</b>	EPA	<b>Incident Category:</b>	Removal Action
<b>NPL Status:</b>	Non NPL	<b>Operable Unit:</b>	
<b>Mobilization Date:</b>	8/4/2014	<b>Start Date:</b>	8/4/2014
<b>Demob Date:</b>	11/1/2014	<b>Completion Date:</b>	11/1/2014
<b>CERCLIS ID:</b>	ORN001001174	<b>RCRIS ID:</b>	
<b>ERNS No.:</b>		<b>State Notification:</b>	6/4/14
<b>FPN#:</b>		<b>Reimbursable Account #:</b>	

1.1.1 Incident Category

Abandoned historical mercury mine and mill.

1.1.2 Site Description

1.1.2.1 Location

The Bonanza Mine and Mill Site is located near the small community of Nonpareil, 6 miles east of Sutherlin, Douglas County, Oregon. The Site is located in the SW ¼ of Section 16 of Township 25 South, Range 4 West, Willamette Meridian (latitude N43° 23'46", longitude W123°10'54").

Except for one former building used as a residence, other mine and mill buildings are no longer present, leaving only the mill concrete foundations, calcine, and waste rock. The mine had 12 adits and more than three miles of subterranean tunnels and shafts. The mine adits have since been abandoned, and no open adits have been located during the 2014 removal action.

Five residences are located close to the mine, including two residences within 200 feet of the former mill. Besides roads and driveways leading to the residences, the land is undeveloped. The nearest off-Site residences are located about a half mile away, to the northeast, along Banks Creek Road.

The Bonanza Mine has an operation history extending from the mid-1860s through 1960. The main mercury-containing mineral is cinnabar, although metacinnabar and native mercury were also reported in the mine workings. Total recorded mercury production was 39,540 flasks (or 3,005,040 pounds).

1.1.2.2 Description of Threat

The data from numerous environmental investigations shows that environmental media are contaminated by elevated concentrations of mercury, arsenic, and other metals, and the source of metals is from historical mercury mining, processing, and disposal operations. Elevated metals concentrations are present in calcine, waste rock, and soil at the former mill site, the surrounding hillside, and valley floor.

1.1.3 Preliminary Removal Assessment/Removal Site Inspection Results

Data regarding the nature and extent of the contaminants of concern found at the Site are summarized

below.

#### 1999 – Preliminary Assessment

Ecology and Environment, Inc. (E&E) completed a Preliminary Assessment (PA) of Red Rock Road (Road) for EPA in May 1999. The PA evaluated the potential for exposure to public health and the environment from potential metals contamination associated with the Road. The Road is a former railroad grade approximately 17 miles long that was constructed of calcine from the Bonanza Mine. The amount of material used in construction of the Road is estimated at 316,000 cubic yards (yd<sup>3</sup>). As a result of the PA, further investigation was recommended.

#### 2000 - Site Inspection

E&E completed a Site Inspection (SI) of Red Rock Road and surrounding watersheds for EPA in May 2000. As part of this SI, nine surface soil samples were collected from potential source areas at the Bonanza Mine Site, including the former mill, calcine, waste rock, and an abandoned adit. Mercury concentrations in these areas ranged from 74 to 12,000 milligram per kilogram (mg/kg), arsenic concentrations ranged from 71.3 to 246 mg/kg, and lead concentrations ranged from 6.5 to 1,240 mg/kg. The total on-Site volume of calcine was estimated at 2,080 yd<sup>3</sup> and waste rock was estimated at 400 yd<sup>3</sup>.

#### 2000 – Removal Assessment

In September 2000, Hart Crowser, Inc. (HC) performed a Removal Assessment (RA) at the former mill site for ODEQ to gather additional data to delineate the extent of metals contamination at the Site. As part of this RA, 31 surface and near-surface soil samples were collected from the former mill site and surrounding hillside. Mercury concentrations ranged from 67.7 to 12,000 mg/kg, arsenic concentrations ranged from 20.3 to 314 mg/kg, and lead concentrations were generally below 70 mg/kg. Calcine, waste rock, and roadway soils also had elevated mercury and arsenic concentrations ranging up to 179 mg/kg and 246 mg/kg, respectively.

One sample each of the former mill soil and calcine were analyzed for mercury speciation. Methyl mercury was detected at 0.03765 mg/kg in soil and 0.00246 mg/kg in calcine. Sequential extraction on soil and calcine indicated that most of the mercury was sulfide-bound, primarily in the form of cinnabar or metacinnabar. Volatile mercury was detected at 2,100 and 2,360 microgram per cubic meter (µg/m<sup>3</sup>).

Water samples were collected from the on-Site well and water storage tank. Arsenic was detected at 0.0536 milligram per liter (mg/L) in a sample collected from the on-Site well and this concentration exceeds the Federal Maximum Contaminant Level (MCL) of 0.005 mg/L for drinking water. Reportedly, well water is used only for agricultural purposes and not for drinking water. Based on the findings of the removal assessment, the first of two removal actions described in Section 2.1.2 (Response Actions to Date) was performed by ODEQ in 2000 in certain areas to achieve prompt human health risk reduction. Water samples have been collected from the spring water storage tank and have consistently had no detections of mercury and arsenic using standard drinking water analytical methods.

#### 2003 – Site Visit

HC returned to the Site on behalf of ODEQ in 2003 to assess whether ecological receptors and/or exposure pathways were present or potentially present at or in the Bonanza Mine Site and along Foster Creek. Impacts to the Site and surrounding properties attributable to contaminated environmental media were not observed during the Site visit. Physical impacts from historical mining operations included the waste rock pile, mine access roads, and mine excavation. Based on the results of the Oregon Natural Heritage Information Center data search and information from the Oregon Department of Fish and Wildlife, HC concluded that there is a possibility that rare, threatened, and endangered species may be present at or near the Site.

#### 2005 – Post-Removal Assessment Report

HC compiled and assessed available information for the Bonanza Mine in 2005 to assist in preparation of a forthcoming Remedial Investigation (RI) Work Plan. This report also developed a preliminary conceptual site model (CSM) for both human and ecological receptors at the Site and identified tasks to be performed during the RI to address data gaps. Volatile mercury was measured in soil from the former mill and calcine. No other environmental media samples were collected as part of this activity. The RI Work Plan has not yet been prepared.

#### 2013 – Soil Assessment

In December 2013, ODEQ screened 118 soil samples using a field portable X-Ray fluorescence spectrometer (FPXRF) to gather additional data to identify those areas where soil concentrations are below a site-specific background concentration for arsenic and a residential risk-based concentration for mercury. Nine discrete soil samples were also collected and sent off-Site for laboratory analysis. The results of this assessment indicated that arsenic and mercury contamination is more widespread in the northern portion of the property than previously anticipated. The results also showed that arsenic and mercury contamination extends into the southern portion of the Site near two existing residences.

## 2. Current Activities

### 2.1 Operations Section

#### 2.1.1 Narrative

#### 2.1.2 Response Actions to Date

**2.1.2.a** The following removal actions have been undertaken by the Oregon Department of Environmental

Quality (ODEQ) in the past:

#### 2000 – Removal Action

Based on the findings of the 2000 HC RA, HC performed a removal action at the former mill site for ODEQ from 14 through 29 September 2000. The objective of this action was to provide prompt risk reduction by excavating soil exceeding 230 mg/kg mercury in the mill area, and for arsenic and lead the cleanup goals were 50 mg/kg and 400 mg/kg, respectively. Eight yd<sup>3</sup> of soil were excavated from the mill furnace area, and this material was transported off-Site for disposal as hazardous waste. Approximately 240 yd<sup>3</sup> of mercury-contaminated soil was excavated from the mill area and placed in a lined and covered temporary storage cell near the base of the waste rock pile. This material was removed from the Site in April 2004 and transported off-Site for disposal. Larger debris such as concrete, firebrick, and a metal furnace were placed in a subsurface vault located at the former mill site. Disturbed areas were restored, as closely as possible, to the original site conditions.

Confirmation soil samples were collected after the removal action. A few samples exceeded the mercury cleanup goal (up to 6,400 mg/kg); however, these sample areas are beneath two to six feet of clean material. Characterization samples collected from the surrounding hillside, calcine, waste rock pile, roads, driveways, and cell base had mercury concentrations ranging from 1.53 to 220 mg/kg. Four samples with greater than 230 mg/kg mercury were from the mine adit (306 mg/kg), the temporary repository (500 mg/kg), an area south of the former mill (930 mg/kg), and a small area where free mercury was observed (5,100 mg/kg).

#### 2014 – Removal Action

NRC Environmental, with technical support and documentation from APEX, performed a second removal action at the Site for ODEQ in February 2014. The objective of this action was to achieve prompt human health risk reduction by removing and capping soil in certain inhabited areas of the Site that were impacted by elevated concentrations of mercury and arsenic. At the time this removal action was performed, the contaminants of concern were mercury and arsenic, and the cleanup goals were 23 mg/kg and 17 mg/kg, respectively.

Prior to implementation of the removal action, FPXRF screening was performed at 118 points scattered across the Site. Arsenic ranged from non-detect to 471 parts per million (ppm), and mercury concentrations ranged from non-detect to 1,200 ppm. Using this information, six areas were identified that had arsenic or mercury concentrations above the cleanup goals. During conduct of the removal action (12 through 21 February 2014) and follow-up site visit (12 March 2014), 39 additional data points were collected from across the Site with the purpose of better understanding the metals distribution across the Site. Arsenic concentrations in these points ranged from non-detect to 81 ppm, and mercury concentrations ranged from non-detect to 459 ppm. The results indicated that the mine-waste contamination from the mill site area is more widespread than previously anticipated, including contamination encountered near two existing home sites.

The largest areas of contaminated soil encompass about 16 acres, including the original mill site and calcine pile. ODEQ determined that these areas could not be excavated at this time due to resource constraints. Temporary fencing and gates were installed to restrict access to certain areas and the existing blackberry vegetation restricting access to Area 4 was left undisturbed. Approximately 60 yd<sup>3</sup> of contaminated soil and firebrick were excavated from the smaller areas, and this material was placed in a temporary cell near the base of the waste rock pile where it remains. Disturbed areas were restored, as closely as possible, to the original site conditions.

**2.1.2.b.** The following removal actions have been undertaken by EPA as part of this ongoing removal action:

Personnel and equipment were mobilized to the Site beginning August 4th. During the first week, initial activities focused on establishing the Site infrastructure, including clearing and constructing equipment storage and laydown areas, installing BMPs, setting up the project command post, and coordinating with on-Site residents. In addition, project staff coordinated with the community, including nearby neighbors, the Douglas County Sheriff, the Douglas Forest Protective Association, Douglas County Planning Department, Douglas County Library, Pacific Power and Light, and other local agencies and persons. Field personnel also began clearing (felling, trimming, and cutting trees) and grubbing (removal of tree stumps, roots, and bushes) to remove trees and vegetation from the calcine and waste rock piles where the repository will be constructed. Individual and perimeter air monitoring, soil screening and sampling, and BMP monitoring and inspection occur each day.

Heavy storms threatened work early the second week, but progress resumed. The footprint for the repository was verified. Field personnel started grading the waste rock pile to lower the elevation and to reduce the footprint of the pile, and to begin to cover the calcine pile with waste rock. Completed demolition of the concrete remnants of the former mill and excavation of approximately 3,296 yd<sup>3</sup> of mine-waste material from the mill area and consolidated these materials in the repository. Encountered significant volumes of material which by appearance looked to be free or elemental mercury on the ground surface and on woody debris in the mill area, which is not surprising since the mine and mill operated from the mid-1860s to the 1960s and produced more than 3,000,000 pounds of mercury. The mercury was removed using a mercury recovery vacuum and hand tools. Due to the location of the mercury in combination with the method of recovery, the mercury could not be separated from the surrounding media in all instances during cleanup and was removed as a commingled waste along with soil and other debris such as wood and roots. Two 55-gallon drums of commingled waste has been recovered from the former mill area. Started clearing and grubbing to remove trees and vegetation from Area 2 and started the excavation and removal of mine-waste contaminated material from this area. Completed coordination with affected homeowners for the removal and temporary storage of personal items removed from the trailers to be replaced, sampled the trailers to ensure proper waste characterization, and started the process for replacement of the trailers.

### 2.1.3 Enforcement Activities, Identity of Potentially Responsible Parties (PRPs)

EPA has initiated a PRP search for this Site, and EPA will continue to collect and analyze additional information about mining companies involved with operations at the Site and/or owners of the Site.

### 2.1.4 Progress Metrics (as of 08/29/14)

Waste Stream	Medium	Quantity	Manifest #	Treatment	Disposal
Co-mingled Hg Waste	Soil and other Debris	(3) 55-gallon drums	-	Permanent retirement	TBD
Elemental Hg (approx. 1 pint)	Hg mixed with soil	(1) 5-gallon pail	-	Macro-encapsulation	RCRA Subtitle C Facility (TBD)

As mentioned in 2.1.2.b, approximately 3,296 yd<sup>3</sup> of mine-waste material, which included micro de minimus quantities of mercury was excavated from the mill area and consolidated at the repository. The excavation extended to a maximum depth of about 14 feet below ground surface in certain areas due to the presence of recoverable mercury (i.e., about the size of a BB and larger). The overall area was over-excavated because it was the location of the former mill, the presence of recoverable free mercury, and the exceptionally high LUMEX mercury monitor readings.

## 2.2 Planning Section

### 2.2.1 Anticipated Activities

#### 2.2.1.1 Planned Response Activities

##### **Excavations**

The FPXRF was deployed in Area 2 to assess the concentration of site contaminants at a depth of 24 inches below ground surface (bgs), which was the planned extent of contamination. The maximum concentration of arsenic and mercury at this depth was 579 mg/kg and 5626 mg/kg, respectively. OSC Heister conferred with OSC Liverman to extend the depth of excavation to 36 inches bgs. An unknown adit was discovered by the excavator operator at a depth of 36 inches in the southern section of Area 2. After the adit was uncovered the ambient air was screened with the Lumex mercury vapor analyzer (50,000 ng/m<sup>3</sup>) and soil screened with the FPXRF (980 mg/kg of arsenic and 2675 mg/kg of mercury). The adit was excavated to a depth of approximately 8 feet bgs then backfilled with bentonite and 4 to 8 inch gabion rock. The total volume of excavated mine-waste material from Area 2 was 9120 yd<sup>3</sup> (as of 8/26/14), which was nearly 4 times the initial estimate of 2400 yd<sup>3</sup>.

Excavation of mine-waste material at Area 4 ranged from 18 – 36 inches bgs and was guided by the FPXRF. The eastern section of Area 4 had limited concentrations of site contaminants while hot spots were identified in the western and northern sections and required excavation to a depth of 36 inches bgs. One screening location near the road in Area 4 had a concentration of mercury (7059 mg/kg) at 18 inches bgs which was the highest recorded on site by the FPXRF. The access road along the western edge of Area 4 was excavated on 8/27 and 8/28. The total volume of excavated mine-waste material from Area 4 was 2540 yd<sup>3</sup> (as of 8/26/14).

Area 1 south of the repository and east of the staging area was cleared and grubbed. This section was excavated to a depth of 2 feet bgs and screened with the FPXRF. The total volume of excavated mine-waste material from Area 1 was 1360 yd<sup>3</sup> (as of 8/26/14).

Excavation at the Mill Site was performed during the first reporting period which is detailed in Polrep #1. The total volume of excavated mine-waste material from the Mill Site was 3488 yd<sup>3</sup>, and the total volume of concrete debris from the Mill Site was 96 yd<sup>3</sup>.

A total of 8 soil samples were submitted to an off-Site laboratory for confirmation analysis of arsenic and mercury via EPA Methods 6020 and 7471, respectively. The samples were collected from the Mill Site, Area 2, and the anticipated borrow source. Expected turn-around time for results ranges from 48 hours to 5 business days.

##### **Residential Screening and Sampling**

The property identified as Residence 4, also known as the Superintendent's house, was screened with field instrumentation. Concentrations of mercury vapor ranged from 67 to 116 ng/m<sup>3</sup>; the rooms nearest the entrance were greater than 100 ng/m<sup>3</sup> and the rooms furthest from the entrance less than 100 ng/m<sup>3</sup>. The area outside the house was screened with the Lumex with a range of non-detect to 150 ng/m<sup>3</sup>. The FPXRF was deployed around the entrance to the house at 5 locations; the concentration of arsenic ranged from non-detect to 24 mg/kg, and mercury ranged from non-detect to 202 mg/kg.

Previously submitted bulk samples collected from Home Sites 1 and 2 identified asbestos-containing material (ACM) that will require abatement prior to disposal; the abatement was tentatively scheduled for 8/29. In addition, toxicity characteristic leaching procedure (TCLP) results for both Home Sites were less than the required criteria for RCRA Subtitle C disposal restrictions which will allow the debris from the Home Sites to be disposed at the municipal landfill.

##### **Repository**

Continued placing mine-waste contaminated material into the repository and grading and shaping. The cleared and grubbed vegetation from throughout the site was staged near the southeast perimeter of the repository.

### **Best Management Practices**

Continued to monitor and measure Site conditions and maintain Site BMPs. Continued to deploy the DataRam particulate monitors around the top of the repository, the staging area, and Residence 3 or 4. Dust suppression efforts were generally effective, even during the hottest days. For example, the time-weighted average (TWA) of particulates from 8/18 to 8/23 ranged from 3.5 to 57.3  $\mu\text{g}/\text{m}^3$ , which was considerably less than the action level of 1400  $\mu\text{g}/\text{m}^3$ .

### **Greener Cleanup Best Management Practices**

START and ERRS collected and segregated plastic bottles and metals cans for recycling. Air-conditioning was used sparingly during the early mornings in the job trailers at the Site. A Fire Prevention and Suppression Plan established procedures for fire prevention and suppression of fires set indirectly as a result of the response action activities performed at the Site.

#### **2.2.1.2 Next Steps**

The following removal activities are expected to occur during the next week period (09/02/14 – 9/13/14): complete the excavation of mine-waste contaminated material from Area 1; demolish the trailers and excavate mine-waste contaminated material from the trailer pads and driveways; receive structural fill and wearing course material to reconstruct the road along Areas 2 and 4 leading to Residence 3; install culverts in Areas 2 and 4; continue placing mine-waste contaminated material into the repository and grading and shaping; and continue to monitor and measure Site conditions and to maintain Site BMPs.

#### **2.2.2.1 Issues**

ERRS PM Consider replacing a haul truck with a water truck, if available. Assess whether to extend excavation from Area 4 into the Bonanza Mine Road near the pump house. Continue to assess former mill area.

The extraordinary hot and dry conditions have required that additional personnel and equipment be assigned to ensure that BMPs for minimizing generation and transport of fugitive dust are effective and efficient and to ensure that adequate precautions regarding wild fire prevention and suppression are in-place. The effort has included mobilizing an additional 4,000-gallon water truck with driver, and the purchase of other field equipment such as shovels, pulaskis, and fire extinguishers.

## **2.3 Logistics Section**

### **2.3 Logistics Section**

An additional START member was mobilized to the site on 8/25 to provide support for FPXRF field screening and administrative tasking.

#### **2.5.1 Safety Officer**

All personnel remain at Level C PPE (with full-face respirator) pending results of previously submitted air samples and ongoing air monitoring. Updated Site Respiratory Protection Plan to incorporate EPA, ERRS, and START action levels.

## **2.4 Finance Section**

No information available at this time.

## **2.5 Other Command Staff**

### **2.5.1 Safety Officer**

Daily safety meetings are held. During each meeting, key personnel review the day's planned activities and any pertinent safety-related issues are highlighted. Personnel are also encouraged to present any particular concern or issues and any recommendation for improvement of project work and/or safety.

All personnel are at Level C PPE (with full-face respirator) while working in the hot zone to ensure protection against mercury vapors and mercury and arsenic particulates. Level C PPE may be downgraded in the future pending the results of ongoing air monitoring and sampling.

#### **2.5.2 Liaison Officer**

Outreach activities are being addressed by key project personnel on an as needed basis.

#### **2.5.3 Information Officer**

See 2.5.2. Additionally, a Community Involvement Coordinator (CIC) has been assigned to the project and is available to also assist with outreach activities on an as needed basis.

## **3. Participating Entities**

### **3.1 Unified Command**

While UC is not established, ODEQ is integrated into the project organization, as appropriate.

### **3.2 Cooperating Agencies**

N/A

## **4. Personnel On Site**

EPA – 1  
START – 2

**5. Definition of Terms**

N/A

**6. Additional sources of information**

**6.1 Internet location of additional information/report**

[www.epaosc.org/BonanzaMineandMill](http://www.epaosc.org/BonanzaMineandMill)

**6.2 Reporting Schedule**

POLREPs will be prepared about every two weeks to coincide with OSC rotation schedule.

**7. Situational Reference Materials**

(Reminder - Add certain background documents to the web site)